

## PATENT ABSTRACTS OF JAPAN

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### (54) ELECTROPHOTOGRAPHIC TONER

#### (57)Abstract:

PURPOSE: To obtain an electrophotographic toner not causing offsetting phenomenon or winding of paper at the time of fixation, hardly deteriorating its flowability and transferability and having satisfactory releasability by using a specified org. compd. as a releasing agent.

CONSTITUTION: In an electrophotographic toner made of powdery particles contg. resin particles, a colorant, an electrostatic charge controlling agent and a releasing agent as essential components, a compd. represented by a formula R1-CONH-R2 (where each of R1 and R2 is 9-21C alkyl), e.g. N-caprylstearic acid amide, N-laurylcaprylic acid amide or N-myristylstearic acid is used as the releasing agent. By this compsn., the objective electrophotographic toner having 3-9 $\mu$ m volume average particle diameter and  $\leq 1.15$  ratio of volume average particle diameter to number average particle diameter is obtd.

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**CLAIMS**

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[Claim(s)]

[Claim 1] The toner for electrophotography characterized by using the compound expressed with the following general formula-ization 1 as this release agent in the toner for electrophotography which consists of a fine-particles particle which uses a resin particle, a coloring agent, an electrification control agent, and a release agent as a principal component.

[Formula 1]  $R1-CONH-R2$  (however, R1 and R2 express the alkyl group of carbon numbers 9-21 among a formula, and R1 and R2 may be the same, or they may differ.)

[Claim 2] said fine-particles particle -- the volume mean particle diameter  $D_v$  of 3-9 micrometers -- it is -- and the ratio of the volume mean particle diameter  $D_v$  and the number mean particle diameter  $D_p$  -- the toner for electrophotography according to claim 1 characterized by consisting of a spherical particle whose  $D_v/D_p$  is 1.15 or less.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Industrial Application]** This invention relates to the new toner for electrophotography excellent in a mold-release characteristic and imprint nature.

**[0002]**

**[Description of the Prior Art]** Generally, in the xerography, the sticking-by-pressure heating approach with a heat roller is learned as an approach fixed to paper etc. in a toner image. Although thermal efficiency is good and high-speed fixation is possible for this approach, in order that an another side heat roller front face and a toner may contact under application of pressure in the state of melting, some toner images carry out adhesion transition on a fixing roller front face, and it has the fault that the offset phenomenon which this re-transfers in the paper arises. In order to prevent this phenomenon, a fixing roller front face is formed with the good silicone rubber and good fluororesin of a mold-release characteristic to a toner, and supplying mold-release characteristic liquids, such as silicone oil, to that front face further is performed. Equipment to supply that mold-release characteristic liquid in respect of generating prevention of the offset development of a toner, in addition to this mold-release characteristic liquid for offset prevention heating, evaporating, and giving an unpleasant smell, although this approach is very effective is needed.

**[0003]** moreover, good low-temperature fixable one requires of a toner in recent years for improvement in the speed of a copy, and energy saving -- having -- moreover -- for this reason, the thing of low softening temperature is used as binder resin. However, if low softening temperature resin is made to contain in a toner, it will become easy to generate an offset phenomenon and the so-called coiling-round phenomenon in which a copy paper coils around a heat roller front face at the time of fixation.

**[0004]** Then, although adding various waxes, such as a solid silicone varnish, a higher fatty acid, and higher alcohol, as a release agent is proposed as a means to prevent these phenomena, in JP,51-143333,A, 57-148752, 58-97056, and a 60-247250 official report, the actual condition is that the release agent which shows sufficient offset-proof nature and coiling-round-proof nature is not yet found out, maintaining good low-temperature fixable one.

**[0005]** In order to make a mold-release characteristic discover efficiently on the other hand, and in order to give a mold-release characteristic to the toner which has sharp particle size distribution with the diameter of a granule, also making a toner particle front face adhere or fix an above-mentioned release agent by externally adding is already known. For example, the approach of mixing a low-melt point point wax with a toner with a ball mill etc. to JP,63-11955,A, and coating a toner front face with a low-melt point point wax is indicated. Although the approach of mixing polyethylene resin and polyethylene impalpable powder with a toner is indicated by JP,63-61265,A and JP,64-54458,A By these approaches, although a release agent adheres to some toner front faces, when the release agent which separated exists, the effectiveness of preventing an offset phenomenon is weak, and there is a fault of polluting a photo conductor by the release agent which separated with a toner.

**[0006]** moreover -- the approach and JP,63-244053,A which mix 2-micrometer polypropylene to a 8-

micrometer toner in JP,63-41861,A, and are stuck on a front face under heating application of pressure - a toner -- receiving -- a particle-size ratio -- the approach of fixing 0.2 or less mold-release characteristic particle on a front face by the mechanical shock is proposed. However, in order to make a toner particle fix a release agent so that an isolation release agent may not be produced, since the particle size of a release agent needs to be 1/10 or less [ of toner particle size ], the approach of JP,63-41881,A is not enough as it. Moreover, by the approach that low molecular weight polypropylene and low-molecular-weight Pori Ellen which are generally used to a toner are usually well-known, it is not ground, but for this reason, the method of once dissolving in a solvent and depositing these in \*\*\*\*\* is proposed so that it may be indicated by JP,63-244053,A. However, by this approach, although a particle-like grinding object is obtained in part, there is a fault of remaining in a toner, without forming an aggregate and cracking this. Moreover, although the approach by the heating fuel spray is also learned, by this approach, the magnitude of several [ at most ] micrometers is a limit. Thus, the actual condition is that the polyolefines of low molecular weight are not obtained as particle-like fine particles. In order to solve these problems, in JP,63-300245,A, adhering a release agent to a toner front face in wet using the emulsion waxes which atomized is proposed, but in the general release agent currently indicated here, although the effectiveness of a mold-release characteristic is demonstrated, the fluidity of a toner and the imprint nature from a photo conductor to paper fall, and there is a actual activity top problem.

[0007]

[Problem(s) to be Solved by the Invention] This invention aims at offering the toner for electrophotography which solves the trouble of the conventional technique mentioned above, prevents coiling round of an offset phenomenon and paper and does not have lowering of 2 fluidities and imprint nature at the time of 1 fixation and which has sharp particle size distribution with the diameter of 3 granules, and has the property which was [ be / a mold-release characteristic / good ] excellent.

[0008]

[Means for Solving the Problem] According to this invention, in the toner for electrophotography which consists of a fine-particles particle which uses a resin particle, a coloring agent, an electrification control agent, and a release agent as a principal component, the toner for electrophotography characterized by using the compound expressed with the following general formula-ization 1 as this release agent is offered.

[Formula 1] R1-CONH-R2 (however, R1 and R2 express the alkyl group of carbon numbers 9-21 among a formula, and R1 and R2 may be the same, or they may differ.) -- according to [ again ] this invention -- the volume mean particle diameter  $D_v$  of 3-9 micrometers -- it is -- and the ratio of the volume mean particle diameter  $D_v$  and the number mean particle diameter  $D_p$  -- the toner for electrophotography characterized by consisting of a spherical particle whose  $D_v/D_p$  is 1.15 or less is offered.

[0009] As an example of a compound expressed with said general formula-ization 1 used as a release agent in this invention For example, N-capryl lactam octadecanamide, N-lauryl capric-acid amide, An N-oleyl lauric-acid amide, N-Millis Chill myristic-acid amide, N-PAL methyl octadecanamide, N-behenyl PAL methine acid amide, N-stearyl octadecanamide, N-stearyl oleic amide, N-stearyl erucic-acid amide, N-oleyl octadecanamide, An N-oleyl ricinoleic-acid amide, N-oleyl oleic amide, N-~~OREIRUPA~~ rutin acid amide, N-behenyl isostearic acid amide, an N-12 hydroxy stearyl adipic acid, N-stearyl behenic acid, N-PAL methyl sebacic acid, N-Millis Chill erucic acid, etc. mention, and it is \*\*\*\*\*. These release agents are good to use it in 0.5 - 5.0% of range to a resin particle.

[0010] moreover, as a resin particle used by this invention Well-known various thermoplastics can be used widely conventionally. For example, styrene, PARAKUORE styrene, vinyltoluene, a vinyl chloride, Vinyl acetate, PURIPION acid vinyl, a methyl acrylate (meta), an ethyl acrylate (meta), Acrylic-acid propyl, allyl compound (meta) acid n-butyl, isobutyl acrylate (meta), (Meta) Acrylic-acid dodecyl, 2-ethylhexyl acrylate (meta), (Meta) Acrylic-acid lauryl, acrylic-acid (meta) 2-hydroxyethyl, (Meta) 2-hydroxypropyl acrylate, acrylic-acid (meta) 2-chloro ethyl, (Meta) Acrylonitrile, an AKURI (meta) amide, an acrylic acid (meta), (Meta) Vinyl methyl ether, vinyl ethyl ether, the vinyl isobutyl

ether, The polymer of monomers, such as a vinyl methyl ketone, N-vinyl pyrrolidone, N-vinylpyridine, and a butadiene, the copolymers which consist of two or more kinds of these monomers, or those mixture are mentioned. in addition, polyester, polyurethane, a polyamide, an epoxy resin, rosin, denaturation rosin, terpene resin, phenol resin, aliphatic series or alicycle group system hydrocarbon resin, aromatic series system petroleum resin, etc. are independent -- or it can be mixed and used.

[0011] The following is mentioned as a coloring agent used by this invention.

black pigment: -- carbon black (oil fur NEESU black, channel black, lamp black, acetylene black, etc.); - azine system coloring matter like aniline black, metal salt azo dye, a metallic oxide, and a compound metallic oxide.

Yellow pigment: Cadmium yellow, mineral fast yellow, nickel titan yellow, naphthol yellow S, Hansa yellow G, Hansa yellow 10G, benzidine yellow GR, a quinoline yellow lake, the permanent yellow NCG, the Tartrazine lake.

Orange pigment: A molybdenum orange, permanent Orange GTR, pyrazolone Orange, indanthrene brilliant Orange RK, a benzidine orange G, indanthrene brilliant Orange GK.

Red pigments: Red ocher, cadmium red, and Permanent Red 4R, Lithol Red, pyrazolone red, Watchung Red calcium salt, Lake Red D, brilliant carmine 6B, eosine lake, rhodamine lake B, alizarin lake, and brilliant carmine 3B.

Purple pigment: The fast violet B, Violet Lake.

Blue pigment: Cobalt blue, alkali blue, a Victoria blue lake, a copper phthalocyanine blue, a non-metal copper phthalocyanine blue, a copper-phthalocyanine-blue partial chlorination object, Fast Sky Blue, indanthrene blue BC.

Green pigments: When chrome green, chrome oxide, pigment Green B, the Malachite Green lake, and dyeing color, an oil color and a disperse dye can be used, and these can mix and use one sort or two sorts or more in this case.

[0012] Moreover, what is shown below is mentioned as an electrification control agent in this invention. Nigrosine, the azine system color containing the alkyl group of carbon numbers 2-16 (JP,42-1627,B), basic dye (C.I.Basic Yellow 2 [ for example, ] (C. I.41000) --) C. -- I.Basic 3 (C. -- I.Basic Red 1 (C. I.45160) --) Yellow C. I.Basic Red 9 (C. I.42500), C.I.Basic Violet 1 (C. I.42535), C. I.Basic Violet 3 (C. I.42555), C. I.Basic Violet 10 (C. I.42170), C. I.Basic Violet 14 (C. I.42510), C. I.Basic Blue 1 (C. I.42025), C.I.Basic Blue 3 (C. I.51005), C. I.Basic Blue 5 (C. I.42140), C.I.Basic Blue 7 (C. I.42595), C. I.Basic Blue 9 (C. I.52015), C.I.Basic Blue 24 (C. I.52030), C. I.Basic Blue 25 (C. I.52025), C. I.Basic Blue 26 (C. I.44045), C. I.Basic Green 1 (C. I.42040), C.I.Basic Green 4 (C. I.42000) etc., The lake pigment of these basic dye, C.I.Solvent Black 8 (C. I.26150), Quarternary ammonium salt, such as benzoyl methyl-hexadecylammonium chloride and DESHIRU trimethyl chloride Or dialkyl lead compounds, such as dibutyl or dioctyl, a dialkyl lead borate compound, Polyamine resin, such as a guanidine derivative, a vinyl system polymer containing the amino group, and a condensed system polymer containing the amino group, JP,41-20153,B, 43-27596, 44-6397, The metallic complex of the monoazo color indicated by 45-26478, JP,55-42752,B, Metal complexes of the salicylic acid indicated by JP,59-7385,B, dialkyl salicylic acid, a naphthoic acid, and dicarboxylic acid, such as Zn, aluminum, Co, Cr, and Fe, this sulfonated phthalocyanine pigment.

[0013] Although the approach of carrying out kneading grinding of a thermoplastics particle, a coloring agent, an aforementioned electrification control agent, and an aforementioned release agent and the approach of carrying out a suspension polymerization with a monomer are also effective as an approach of creating the toner of this invention, particle size distribution are sharp, and in order to obtain the toner of the diameter of a granule, after coloring-izing the polymerization particle obtained by the distributed polymerization method, it is desirable to perform surface treatment by the release agent.

[0014]

[Example] An example explains this invention below.

[0015] Example 1 Styrene / methyl acrylate copolymer The 100 weight sections (copolymerization ratios 55/45)

Carbon black Ten weight sections N-oleyl lauric-acid amide Five weight sections 3, 5, JITA challis

butyl salicylic acid zinc complex Heating kneading was carried out with the hot calender roll, the mixture which consists of the 5 weight sections above was ground and classified, and black fine particles with a volume mean particle diameter of 9 micrometers were obtained. To this fine-particles particle 100 weight section, the colloidal silica 0.3 section was added and mixed and the toner of this invention was obtained. This toner 3 weight section was mixed with the iron powder carrier 100 weight section, and the two-component system developer was produced. This developer was put into the magnetic brush developer, the electrostatic latent image formed by the usual xerography on the organic photo conductor was developed, this was imprinted, giving corona discharge to a regular paper, when heat fixation was carried out with the fixing roller which does not supply silicone oil, neither coiling round of paper nor generating of an offset phenomenon is in the range with a fixation temperature of 150-210 degrees C, and the good image was obtained.

[0016] Instead of the N-oleyl lauric acid of example of comparison 1 example 1, the toner for a comparison was obtained like the example 1 except having used low molecular weight polypropylene. Subsequently, when this toner was set in the same equipment as an example 1 and image \*\*\*\* was performed, roller coiling round of paper arose at the fixation temperature of 170 degrees C or less.

[0017] The example 2 styrene 70 weight section, the n-butyl methacrylate 30 weight section, the carbon 10 weight section, and metal-containing azo dye (the ORIENT chemistry company make, S-34) were distributed to homogeneity using the homogenizer in 2% water solution of polyvinyl alcohol, the suspension polymerization was performed using the azobis isobutyl nitril 2 weight section, and the fine-particles particle was obtained. Furthermore, the fines section and the coarse powder section were cut and the black particle with a mean particle diameter of 8 micrometers was obtained from this fine-particles particle. Distributed the above-mentioned black particle 100 weight section underwater, added the N-PAL methyl stearin acid AMIDONO emulsion (solid content [ of 20% ], mean particle diameter of 0.18 micrometers) 10 weight section, 20ml of stearyl amine acetate water solutions was dropped 1% at the bottom of churning, N-PAL methyl octadecanamide was made to adhere to a black particle front face, filtration desiccation was carried out, and the toner of this invention was obtained. Next, this toner 3 weight section was mixed with the iron powder carrier 100 weight section, and the two-component system developer was produced. When this developer was set in an example 1 and equipment of the same kind and fixation temperature was copied every 10 degrees C in the range of 150-210 degrees C, there is no coiling round of an offset phenomenon and paper at each temperature, and the clear image was obtained.

[0018] The example 3 styrene 60 weight section and the 2 ethylhexyl methacrylate 30 weight section, and the butyl acrylate 10 weight section were copolymerized under existence of polyvinylpyrrolidone as a distributed stabilizer in the methyl alcohol solvent, and the spherical fine-particles particle with narrow ( $D_v/D_p$  is 1.09) particle size distribution was obtained with the mean particle diameter of 6 micrometers. Next, the oil black 860(ORIENT chemistry company make) 4 weight section and the macro REXX Orange R(product made from BATER) 1 weight section were added, and it agitated for 8 hours, and dyed [ this fine-particles particle 100 weight section was distributed in the methyl alcohol 400 weight section, and ], agitating at a room temperature, and the black particle was obtained. Distributed this black particle 100 weight section to the water-methanol mixed solvent, and added the emulsion (solid content [ of 25% ], mean particle diameter of 0.12 micrometers) 4 section of N-ZUTEARIRU octadecanamide, N-stearyl octadecanamide was made to adhere to the front face of a black particle, adding and agitating 20g of 10% water solutions of perfluoroalkyl trimethyl ammonium salts, filtration desiccation was carried out, and the toner of this invention was obtained. Next, this toner 3 weight section was mixed with the iron powder carrier 100 weight section, and the two-component system developer was produced. When copied by setting this developer to a digital copier, a photo conductor to the rate of an imprint was 93%. The black image which excelled [ temperature requirement / 150-210-degree C / fixation ] in dot repeatability without an offset phenomenon was obtained. Although 50,000 more sheets were copied repeatedly, the copy image with clear all that do not have the contamination to a photo conductor or a carrier and do not have coiling round of an offset phenomenon or paper was obtained.

[0019]

[Effect of the Invention] As mentioned above, the toner for electrophotography of this invention has the property which was excellent as following so that it may understand.

- (1) There is no generating of the offset phenomenon at the time of fixation, and there is nothing with [ of the paper to a fixing roller ] a volume.
- (2) It has sharp particle size distribution with the diameter of a granule, and high quality and high endurance are shown.
- (3) The imprint nature from a photo conductor to paper is good, and excellent in the mold-release characteristic.

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[Translation done.]